NEW FLOATING EQUIPMENT FOR BELGIAN HYDROGRAPHIC SERVICES.

Two vessels designed especially for the Hydrographic Service are of recent construction: the "De Parel", built in 1938 for operations on the Scheldt, and the "Paster Pype", for surveys in the North Sea, built in 1939 but lost during the war and rebuilt in 1949.

Designed for a similar purpose, both vessels are very much alike apart from differences in size and equipment fitting one for river-duty and the other for sea-going operations.

The general lay-out of the decks and superstructure on either ship is based on the same idea, as shown on the accompanying plans. An attempt at an overall plan was made that would meet the legitimate demands of the surveyor while preserving a reasonably decorative appearance. A rather high observation deck, free of superstructure, with dead angles of visibility brought to the lowest possible minimum was a primary requirement; a low free-board for the convenient handling of sounding-leads was also desirable; as great a measure of stability as possible was wanted in order to avoid rolling that might interfere with sightings, and of course a light draught, since banks were to be surveyed. The complete elimination of funnels will be noticed in this connection.

The problem on the "Parel" was complicated by the fact that its height above the water-line had to be kept down to 4.10 metres as the vessel had to pass under bridges above Antwerp. The mast and wheel-house accordingly had to be built so that they could be folded down and special arrangements thought out for the various tanks (fresh and salt water tanks, heat-expansion unit) which always add to the height of any vessel with a low free-board.

The measurements decided upon are as follows:

	"De Parel"	"Paster Pype"
Length at water-line	21 m. 450	38 m. 550
Beam	5 m.	7 m. 700
Depth	2 m.	3 m. 700
Mean draught	1 m. 500	2 m. 700

The "De Parel's" observation platform which is in the stern, measures 6 metres by 3.25 metres, and that of the "Paster Pype", ahead of the wheel-house, 7.50 metres by 5 metres.

Aft of the "Parel's" wheel-house and half-way down to the deck below is a structure containing the sounding-machine and a draughting-table with drawers. It opens out onto the observation platform, which can be covered over with an awning. Under the wheel-house is a small semi-circular saloon

for the use of the hydrographic surveyor. There is a closet on either side, one containing a W.C. and the other a wash-basin. There are quarters forward for a crew of six, with a separate galley and store-room.

The same general lay-out, slightly extended, applies to the "Paster Pype", as indicated on the general plans. Forward, below the wheel-house and observation platform, a bridge-house enclosed by a half-deck contains a large, well-lighted draughting-room, and a suite of staterooms of plain but sufficiently decorative appearance at the disposal of the Surveyor. On the deck below are cabins for rated personnel.

Slightly farther astern on the main deck are the mess and galley, and aft, the crew's quarters and mess. Allowance has been made in the stern for adequate space in the vicinity of the compass and in order to facilitate wreck-searching operations, described farther on.

Both the "Parel" and "Paster Pype" are of course equipped with central-heating, running water, and wireless.

A point of extreme significance was the choice of the type of propulsion to be used in each vessel, and then deciding which was the best design of the type selected. Propelling machinery capable of great responsiveness and of the widest possible range of speeds was essential, and it should moreover be able to maintain any intermediate speed continuously at a steady rate. Quite a few surveys are made at a slow rate of speed which the hydrographic surveyor insists must be well-defined and constant, as knowledge of it is necessary in estimating distances covered, particularly when sections are being determined with a sounding-lead. It must be admitted that the old reciprocating steam-engine fulfilled these conditions, but unfortunately the cost of operating it is very high—too high in relation to present technical attainments —especially in operations where low speeds are prevalent and necessarily intermittent. Operating a steam-vessel when the boilers have to be kept under some degree of pressure even when the ship is not moving involves enormous expense. Inevitably a system of internal combustion had to be resorted to. But the Diesel engine did not of itself meet the speed requirements described above.

On the other hand, apart from general readiness of response, it was in the interest of the hydrographic surveyor (an almost indispensable requirement, in fact) that the propelling machinery be controlled directly from the wheel-house—in the hands, as it were, of the surveyor or master of the ship. The desirability of such an arrangement, which considerably increases speed in manœuvering and moreover eliminates the possibility of orders being misunderstood, was increased by the fact that surveying vessels are necessarily apt to run aground. One might almost go so far as to say that running aground is deliberate in certain cases. Strengthening the keel and shaping the hull in such a way as to facilitate the ship's getting clear were inadequate measures: quickness and sensitiveness of response were also prime requisites.

The problem was obvious: as soon as Diesel engines had been decided upon in order to cut down operating cost, a system of electrical transmission

had to be considered that owing to the low rates of power involved and flexibility desired could only operate on direct current (Ward Leonard system). In this instance, one of the additional advantages of Diesel electric drive is the fact that it alone, when carefully thought out, can give the propulsion engine (that is, cause the propellers to absorb) a uniform amount of power whether the vessel is stationary or under way. This adds to ship's safety in case it runs aground ; which of course is equivalent to its operating while stationary.

The drive system was finally designed as follows:

A single screw was used, for protective purposes and in order to make it easier to steer the ship and because of the relatively low power involved ; 200 horsepower was enough to give the "Parel" an amply adequate top speed of more than ten knots, and 380 horsepower a speed of over twelve knots to the "Paster Pype".

A choice had to be made between one or two generating units. Two were finally decided upon in spite of the slight additional complication involved: in practice it doubles the amount of Diesel cylinders that have to be attended to. But a surveying vessel, in the final analysis, does all its work at a very low rate of speed and consequently uses little power. It only operates at top speed when proceeding to and from the area of surveying operations, and a moderate rate of speed is desirable enabling it to remain as long as possible in the area being surveyed. The ships use both units while travelling to and away from the latter, and only one while surveying. This one unit, owing to an efficient device that automatically regulates the propulsion engine flux, is able to operate at full power when alone connected with the propeller, and in obedience to the law governing the ratio of power to speed (variations in the amount of power required being approximately equal to the cube of the rate of speed), eighty per cent of the maximum rate obtainable from both units can be reached with one. This is amply sufficient. Moreover, during the longer periods when surveying operations take place, this arrangement decreases the rate of discharge of the Diesel engines. It is a well-known fact that it is harmful for a Deisel engine to run too long on a weak charge, and owing to the very nature of a surveying vessel, this is a risk that the engines are almost permanently subjected to. The use of two units instead of one greatly minimizes the inconvenience since under any conditions, the low charge of the engine in operation will always be twice what it would be with only one generating unit.

There is another important point which argues in favor of a double generating unit. No ordinary ship can replace a vessel specially fitted out for surveying. No untimely accident to its equipment can be afforded that might interfere with a hydrographic expedition, which is essentially dependent upon the time of year and atmospheric conditions. In case of a serious breakdown putting one of the units out of commission, doubling the units will have the effect of limiting the consequences to the relatively insignificant inconvenience of the ship's being compelled to continue its surveying with

a single unit, and of its not being able to travel to its area of operations and back at more than eighty per cent of its maximum rate of speed.

The following characteristics, owing to the foregoing considerations and for various other reasons (such as maximum authorized stowage, most efficient number of screw revolutions, etc.) were finally selected for the propelling machinery: (1)

	"De Parel"	"Paster Pype"
Diesel engines	2 125 HP engines 775 RPM 6 cyl.	2 270 HP engines 500 RPM 6 cyl.
Generating units	2 85 KW dynamos 510/440 volts 775 RPM parallel	2 148 KW dynamos 205/195 volts 500 RPM in series.
Propelling engine	1 210 HP engine 500/437 volts 1.600/1.400 RPM driving screw through reduction gears at 500 RPM under way.	1 380 HP engine 410/390 volts driving screw through reduction gears at 225 RPM under way.

On the "Parel" the 6.7 KW exciters (1500 RPM, 220 volts, shunt excitation and tension regulator) are directly driven by the main units (Renold chain). They feed the excitation circuits and ship's electric mains, and act as reserve units for one another. When the vessel is stationary, a small independent unit can be branched onto the ship's electric mains. The "Paster Pype's " equipment is slightly different. The main generators are equipped with two propulsion exciters and two 17 KW. 230-volt auxiliary generators. They are driven by trapezoidal belts.

The main generators supply the feeding-circuits. They have special exciters causing automatic speed adjustment of the engine to the torque required for its shaft while avoiding overloading the diesels. Automatic power regulators have been added.

The two auxiliary generators feed the ship's electric system.

Since a sea-going vessel is involved, a third independent generating unit may be used as a reserve. The remaining machinery is of a usual kind, consisting of pumps, an air-compressor, relief engine, etc., and requires no description. All the deck-machinery is electrically driven.

Finally the standard equipment of these specialized surveying vessels may be described as follows. Both carry a Hughes super-sonic depth recorder with rotating arm and easy reading-scale: 1 cm. per metre for depths measured

(1) Where two numbers are given, the first refers to operations under way and the second, while stationary.

from the keel of 0 to 12 and 0 to 22 metres, and half this scale for twice the depths mentioned.

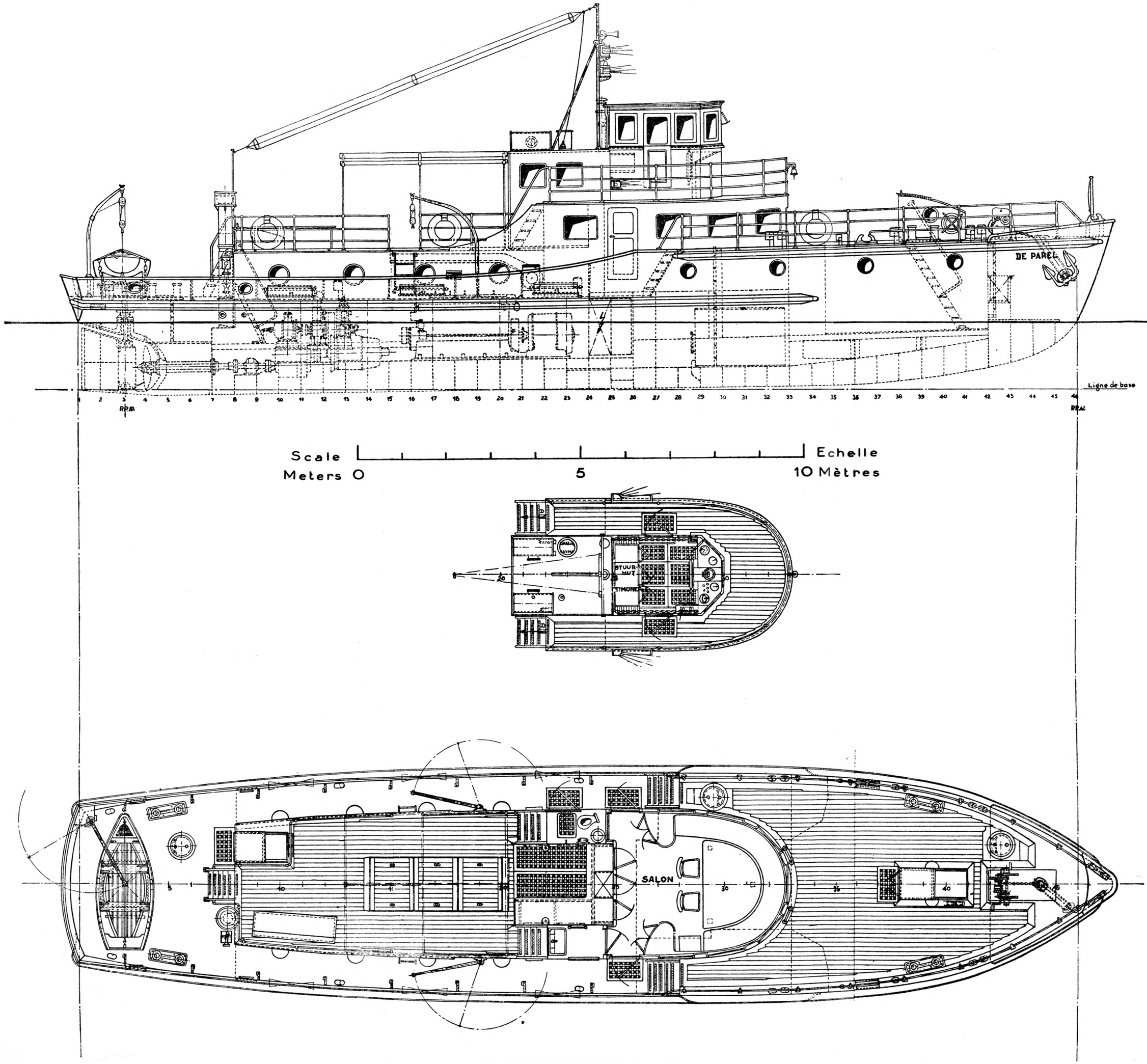
The accompanying plans clearly show the special facilities for sounding by hand, and for guiding the "Paster Pype's" fish-lead.

A motor-boat on the "Paster Pype" and a row-boat on the "Parel", both capable of being lowered promptly and easily into the water, make it possible to explore extremely shallow areas. The "Paster Pype", moreover, is equipped aft with a winch of a rather unusual type: it has two drums, each capable of handling 200 metres of 27 mm. cable ; a heaving-in speed of 48 metres per minute for 50 kgs, and two declutchable winch-heads handling 2000 kgs at 12 metres per minute, making it possible to haul in and to pay out two cables simultaneously, either aft, port or starboard. The cables are used in searching for wrecks. The pilot house on the "Paster Pype" and a special shelter on the "Parel" are especially fitted out together with the observation platform for hydrographic operations. The "Paster Pype", moreover, has facilities enabling the hydrographic surveyor to give the necessary practical instruction to student pilots.

In order to facilitate the transmission of the sounder's readings, each vessel is provided with equipment including a microphone which the sounder attaches to his chest and which is connected to a loudspeaker located in the vicinity of the hydrographic surveyor's usual station, together with a transmitter for any necessary replies.

Instruments controlling the running and steering of the vessels—tachometers, propeller revolution indicators, propulsion controls, etc.—are centered in the wheel-house. A radio-telephone keeps the ship in touch with the shore office.

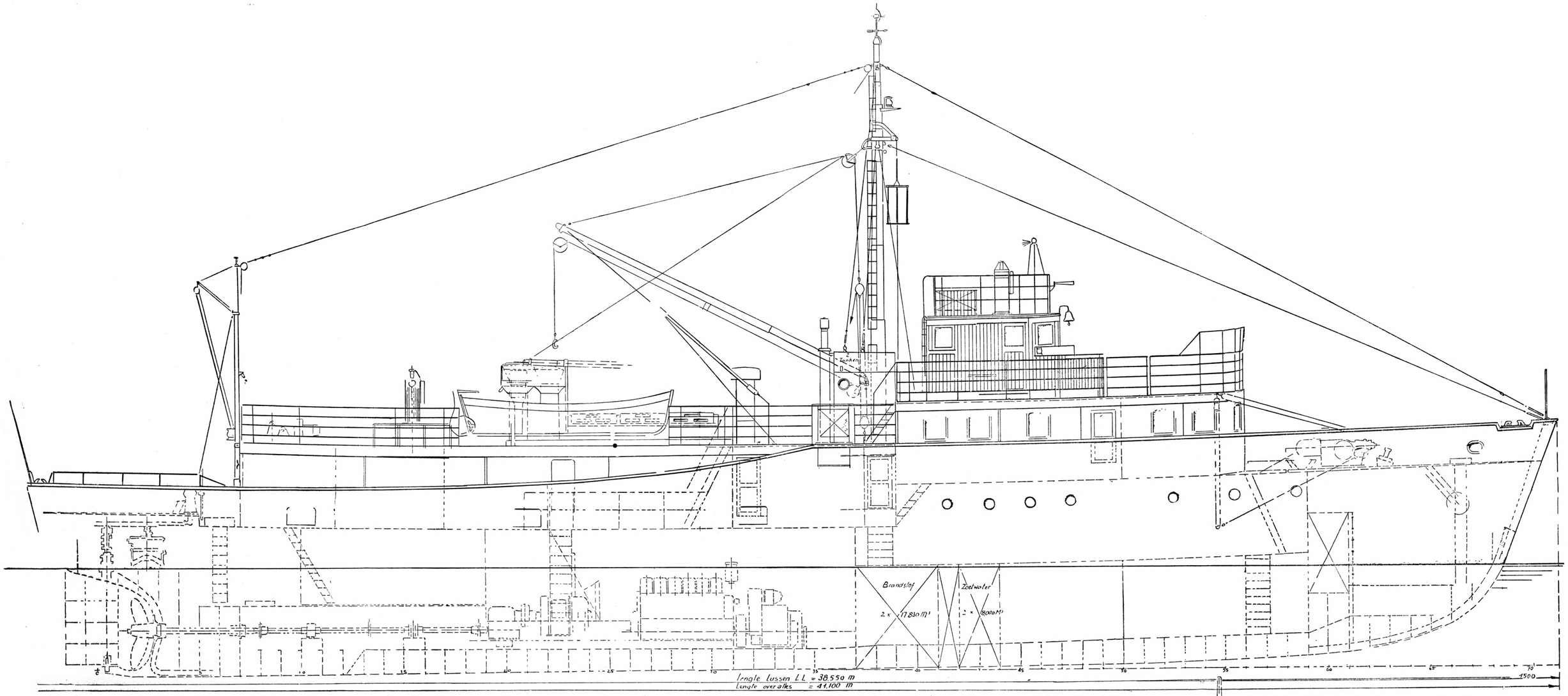
The "Paster Pype" is further equipped with a Decca navigator used in the North Sea within the area covered by the British Decca chain.



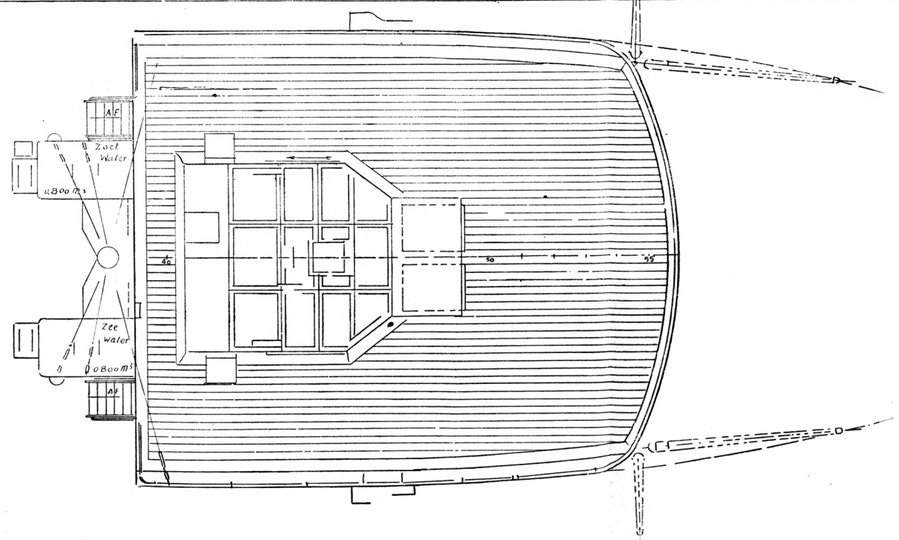
BELGIAN SURVEYING VESSEL " DE PAREL "

PLATE 1

Length over all	24.050 m.
Length between perpendiculars	21.450 m.
Beam	5.000 m.
Mean draught	1.500 m.
Depth	2.000 m.
Maximum elevation above water-line with wheelhouse turned down	4.100 m.



Scale Meters 0 5 10 Echelle 15 Mètres



BELGIAN SURVEYING VESSEL "PASTER PYPE"

PLATE 2

Length over all	41.100 m.
Length between perpendiculars	38.550 m.
Beam	7.700 m.
Depth	3.700 m.
Draught	2.700 m.

BELGIAN SURVEYING VESSEL "PASTER PYPE"

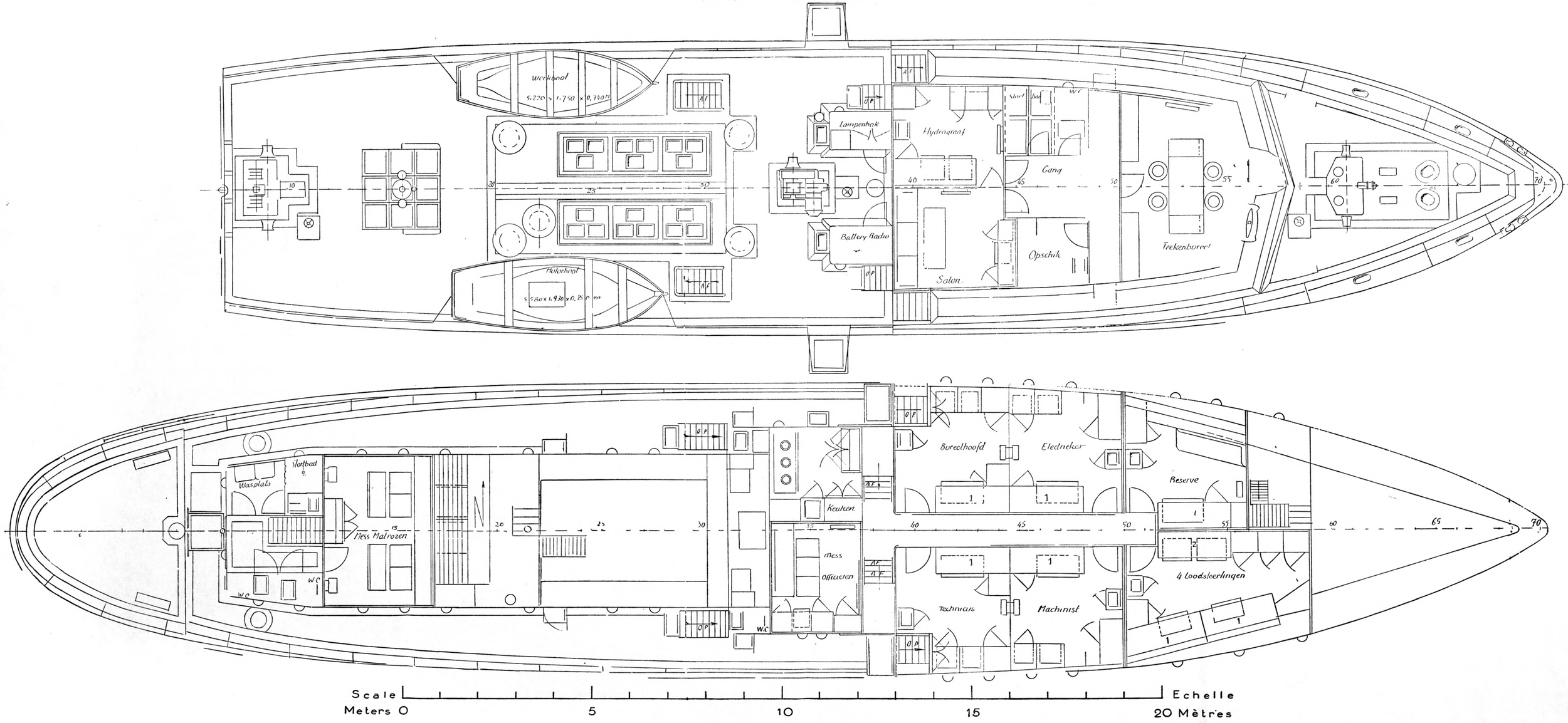


PLATE 3

International Hydrographic Bureau

MONACO . 1948

SYMBOLS and ABBREVIATIONS

Proposed Standard form showing the principal symbols and abbreviations used on the charts.

A. The Coast

1.
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11.
11a.
11b.
11c.
11d.
11e.
11f.
11g.
12.
13.
14.

B. Coast Features

1. 2. 3. 4. 5. 5a. 6. 7. 8. 9. 10. 10a. 11. 12. 13. 14. 15. 16. 16a. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36.

C. Topography (Natural Features)

1.
1a.
2.
3.
4.
5.
5a.
5b.
5c.
5d.
5e.
5f.
6.
6a.
7.
8.
9.
10.
10a.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.

D. Control Points

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.

E. Units, etc.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23.

F. Adjectives

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 18a. 19. 20. 21. 22. 23. 24. 25. 26. 29. 30. 31. 32. 33. 34. 40.

G. Ports and Harbours

1. 2. 3. 4. 5. 6. 7. 8. 8a. 9. 10. 11. 12. 13. 14. 14a. 14b. 15. 15a. 16. 17. 18. 19. 20. 20a. 20b. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 39a. 40. 41. 42. 43. 44. 45. 46. 47. 48.

H. Topography (Artificial Features)

1.
2.
3.
3a.
3b.
3c.
3d.
3e.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
14a.
14b.
14c.
14d.
15.
16.
16a.
16b.
17.
17a.
18.
18a.
19.
20.
21.
22.
23.

I. Buildings

1. 2. 3. 3a. 4. 5. 6. 7. 8. 8a. 8b. 9. 10. 11. 12. 13. 14. 15. 15a. 16. 17. 18. 18a. 19. 20. 21. 22. 23. 24. 25. 26. 26a. 27. 28. 29. 30. 31. 32. 33. 34. 34a. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 64. 65. 66. 67. 70. 71. 72.

J. Miscellaneous Stations

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22.

K. Lights

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 24a. 25. 26. 27. 28. 28a. 29. 30. 31. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 61. 62. 63. 64. 65. 66. 67. 67a. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81.

L. Buoys and Beacons

1. 2. 3. 3a. 4. 5. 5a. 6. 7. 8. 8a. 9. 10. 11. 12. 13. 14. 14a. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 25a. 26. 27. 28. 29. 30. 30a. 31. 32. 33. 34. 41. 42. 43. 44. 45. 46. 47. 48. 51. 52. 53. 54. 55. 56. 57. 58. 59. 61. 62. 63. 64. 65. 70.

M. Radio & Radar Stations

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.

N. Fog Signals

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 18a.

O. Dangers

1. 2. 3. 4. 5. 5a. 6. 6a. 7. 8. 9. 10. 11. 12. 13. 13a. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 23a. 24. 25. 26. 27. 28. 29. 30. 30a. 31. 32. 33. 34. 35. 36. 37. 38. 39. 41. 42. 43. 44. 45.

P. Various Limits, etc.

1. 2. 3. 4. 5. 6. 7. 7a. 8. 8a. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25.

Q. Soundings

1. 2. 3. 4. 5. 6. 7. 8. 9. 9a. 10. 11. 12. 13. 14. 15. 16. 17. 18.

R. Depth Contours and Tints

mètres	fathoms
0.	0.
1.	
2.	1.
3.	
4.	2.
5.	
6.	3.
7.	
8.	4.
9.	
10.	5.
11.	
12.	6.
13.	
14.	7.
15.	
16.	8.
17.	
18.	9.
19.	
20.	10.
30.	
40.	15.
50.	
60.	20.
70.	
80.	30.
90.	
100.	40.
200.	
300.	50.
400.	
500.	100.
600.	
700.	200.
800.	
900.	300.
1.000.	
2.000.	400.
3.000.	
4.000.	500.
5.000.	
6.000.	1.000.
7.000.	
8.000.	2.000.
9.000.	
	3.000.
	4.000.
	5.000.

S. Quality of the Bottom

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 11a. 12. 12a. 13. 13a. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 38a. 38b. 39. 40. 41. 42. 43. 44. 45. 46. 47. 47a. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70.

T. Tides and Currents

1. 1a. 2. 2a. 3. 4. 4a. 5. 6. 7. 8. 8a. 8b. 9. 9a. 9b. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 20a. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34.

U. Compass

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 21. 22. 23. 24. 25. 25a. 26. 27. 28.

V. Abbreviations of Foreign Terms used on National Charts

General Remarks